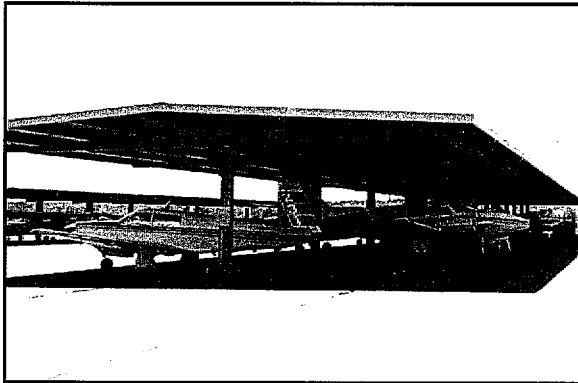




Chapter Three

AVIATION FACILITY REQUIREMENTS

AVIATION FACILITY REQUIREMENTS



To properly plan for the future of Yuma International Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting), and landside (i.e., hangars, terminal building, aircraft parking apron) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives

for providing these facilities will be evaluated in Chapter Four to determine the most cost-effective and efficient means for implementation.

Recognizing that the need to develop facilities is determined by demand, rather than a point in time, the requirements for new facilities have been expressed for the short, intermediate, and long term planning horizons, which roughly correlate to five-year, ten-year, and twenty-year time frames. Future facility needs will be related to these activity levels rather than a specific year. **Table 3A** summarizes the activity levels that define the planning horizons used in the remainder of this master plan.

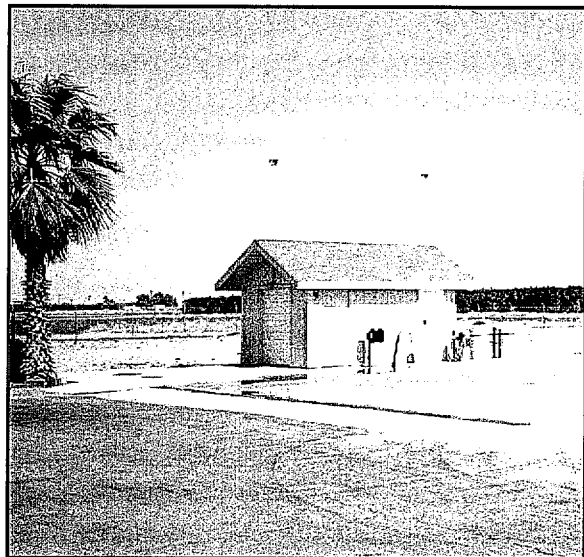


TABLE 3A
Planning Horizon Activity Levels

	Short Term Planning Horizon	Intermediate Term Planning Horizon	Long Term Planning Horizon
Passenger Enplanements	91,000	133,000	174,000
Passenger Deplanements	98,000	144,000	188,000
Enplaned Air Cargo (pounds)			
Normal Growth Cargo Scenario	3,100,000	10,100,00	17,900,000
International Cargo Scenario	9,100,000	21,900,000	35,700,000
Based Aircraft	125	155	185
Annual Operations	129,000	143,600	158,900

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. These facilities are comprised of the following items:

- Runways
- Taxiways
- Navigational Aids
- Airfield Marking and Lighting

The following airfield facilities are outlined to describe the scope of facilities that would be necessary to accommodate the airport's civilian role throughout the planning period.

AIRFIELD DESIGN STANDARDS

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the civilian aircraft which are currently using, or are expected to use the airport. Planning for future aircraft use is of particular importance since design

standards are used to plan separation distances between facilities. These standards must be determined now since the relocation of these facilities will likely be extremely expensive at a later date.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This code, the **Airport Reference Code (ARC)**, has two components: the first component, depicted by a letter, is the **aircraft approach category** and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the **airplane design group** and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an

aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADG's used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

In order to determine facility requirements, an ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Yuma International Airport.

The 1995 Airfield Condition Survey and Load Evaluation prepared for the

MCAS detailed the type of military aircraft using the airport. According to the report a wide variety of military aircraft use the airport on a regular basis and range from helicopters such as the AH-1/UH-1 to fighter aircraft such as the F-5, F-18, and AV-8B and large transport aircraft such as the C-141, KC-135, KC-10, and C-5. The report expected the future mix to remain virtually unchanged through the year 2020.

Civilian use of the airport includes small single and multi-engine aircraft (which fall within approach categories A and B and airplane design group I) and business turboprop, jet aircraft and regional air carrier turbo prop aircraft (which fall within approach categories B, C, and D and airplane design group II). Large transport aircraft operating from the Boeing/Douglas Products Division test facility fall within approach category C and airplane design groups III and IV.

The future civilian fleet mix is expected to include a greater number of aircraft operations by large transport aircraft such as the McDonnell-Douglas DC-9 and Boeing 727 providing air cargo service, regional jet aircraft providing air passenger service, and business jets. The DC-9 and 727 fall within ARC C-III. Typical regional jet aircraft and business jets fall within ARC C-II and D-II. An international air cargo operation would likely involve aircraft such as the Boeing 767, McDonnell-Douglas MD-11, or Airbus A300, all which fall within ARC C-IV. A Boeing 747, which could be used for

international air cargo transportation, falls within ARC D-V.

Considering the existing and future civilian fleet mix at Yuma International Airport, airfield elements should follow ARC D-IV design standards to accommodate the most demanding approach speed requirements of business jet aircraft and the wingspan requirements of large transport aircraft.

The design of taxiway and apron areas should consider the wingspan requirements of the most demanding aircraft to operate within that specific functional area on the airport. The terminal area should consider ADG II requirements to accommodate typical regional jet aircraft. General aviation areas should also consider ADG II requirements to accommodate the full range of business jet aircraft. Future air cargo facilities will require following up to ADG V design standards.

RUNWAYS

The adequacy of the existing runway system at Yuma International Airport has been analyzed from a number of perspectives, including airfield capacity, runway orientation, runway length, and pavement strength. From this information, requirements for runway improvements have been determined for the airport.

Airfield Capacity

An airport's airfield capacity is expressed in terms of its annual service

volume. Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year. The capacity of the airfield is affected by several factors including airfield layout, meteorological conditions, aircraft mix, runway use, aircraft arrivals, aircraft touch-and-go activity, and exit taxiway locations.

Many of the conditions at Yuma International Airport serve to maximize airfield capacity. The existing airfield layout, which includes the parallel runways for military and large civilian aircraft use and crosswind runways for civilian aircraft use, provides for maximum airfield capacity by segregating aircraft of different sizes and speeds. The limited number of days each year that visibility or cloud ceilings are reduced also maximizes airfield capacity. Airport capacity is usually highest in clear weather when flight visibility is at its best, and lower during poor weather conditions when increased aircraft separation standards limit the number of aircraft which can operate at the airport. The number of available exit taxiways reduces runway occupancy times, which increases airfield capacity as well. While the existing runway configuration provides for maximum airfield capacity by segregating aircraft of different sizes and speeds, the aircraft mix, which includes a majority of large aircraft, is also the greatest limiting factor to airfield capacity due to the increased separation standards between each aircraft.

Pursuant to FAA guidelines detailed in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, the existing and future annual service volume for Yuma International Airport has been analyzed. The results of this analysis are summarized in **Table 3B**. The existing annual service is estimated at 299,000 operations and is projected to increase throughout the planning period as the mix changes to include a larger percentage of general aviation and regional air carrier aircraft and lower percentages of military and large civilian aircraft.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, indicates that improvements for airfield capacity should be considered when operations reach 60 percent of the annual service volume. Presently, airfield operations represent approximately 40 percent of the airport's annual service and are forecast to remain below 60 percent throughout the planning period. Therefore, airfield capacity improvements will not be required during the planning period.

TABLE 3B			
Annual Service Volume Summary			
	Annual Operations	Annual Service Volume	Percent Capacity
Existing (1996)	120,530	299,000	40.3%
Short Term	129,000	315,000	40.9%
Intermediate Term	143,600	332,000	43.2%
Long Term	158,900	341,000	46.5%

Runway Orientation

The airport is presently served by parallel Runways 3L-21R and 3R-21L oriented in a northeast-southwest direction, Runway 8-26 oriented in an east-west direction, and Runway 17-35 oriented in a north-south direction. For the operational safety and efficiency of an airport, it is desirable for the principal runway of an airport's runway system to be oriented as close as possible to the direction of the prevailing wind. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA design standards recommend additional runway configurations when the primary runway configuration provides less than 95 percent wind coverage at specific crosswind components. The 95 percent wind coverage is computed on the basis of crosswinds not exceeding 10.5 knots for small aircraft weighing less than 12,500 pounds and from 13 to 20 knots for aircraft weighing over 12,500 pounds. The most current ten years of wind data specific to Yuma International Airport has been examined and is summarized in **Table 3C**. As shown in the table, no single runway orientation provides 95 percent wind coverage for all crosswind

TABLE 3C**Wind Coverage Summary**

Wind Speed (Knots)	All-Weather	Visual (VFR)	Instrument (IFR)
<i>Runways 3L-21R and 3R-21L</i>			
10.5	93.67%	93.73%	84.04%
13.0	96.71	96.77	87.23
16.0	99.17	99.21	91.94
20.0	99.85	99.87	95.91
<i>Runway 8-26</i>			
10.5	93.29%	93.31%	91.28%
13.0	96.15	96.16	93.92
16.0	99.06	99.08	96.45
20.0	99.78	99.79	98.06
<i>Runway 17-35</i>			
10.5	96.90%	96.95%	88.40%
13.0	98.23	98.28	90.42
16.0	99.46	99.50	92.02
20.0	99.86	99.89	95.01
<i>Combined Coverage</i>			
10.5	99.70%	99.71%	98.02%
13.0	99.94	99.95	99.08
16.0	99.99	100.00	99.68
20.0	100.00	100.00	100.00
Source: National Climatic Data Center; Observation Period 1987-1996, Yuma, Arizona			

components and weather conditions. However, the combined coverage of all runways exceeds 95 percent wind coverage. Therefore, no additional runway orientations are needed to achieve minimum wind coverage at Yuma International Airport.

Runway Length

The determination of runway length requirements for an airport are based on five primary factors: airport

elevation; mean maximum temperature of the hottest month; runway gradient (difference in elevation of each runway end); critical aircraft type expected to use the airport, and stage length of the longest nonstop trip destinations.

Aircraft performance declines as each of these factors increase. For Yuma International Airport, summertime temperatures and potential non-stop air cargo flights to destinations in Asia and/or Latin America are the primary

factors in determining runway length requirements.

For calculating runway length requirements at Yuma International Airport, airport elevation is 213 feet above mean sea level (MSL) and the mean maximum temperature of the hottest month is 107 degrees Fahrenheit. Runway 3L-21R has an effective runway gradient of 0.01 percent, Runway 3R-21L 0.22 percent, Runway 8-26 0.31 percent, and Runway 17-35 0.23 percent.

by cargo airlines. In calculating the runway requirements for these aircraft maximum loading (payload and fuel) has been assumed. As shown, runway length requirements can reach as high as 12,500 feet for a fully-loaded MD-11. At its present length of 13,299, Runway 3L-21R can accommodate the full range of commercial cargo aircraft at maximum loading conditions, during the warm summer months. Therefore, additional runway length is not needed for future air cargo operations at Yuma International Airport.

Table 3D summarizes runway length requirements for common aircraft used

TABLE 3D Common Cargo Aircraft Runway Length Requirements	
Aircraft	Runway Length (feet)
McDonnell-Douglas DC-9-30	9,600
Boeing 727-200	11,900
Boeing 757-200	7,900
McDonnell-Douglas DC-8-63F	10,600
Boeing 767-300 ER	10,300
McDonnell-Douglas DC-10-10	12,400
McDonnell-Douglas MD-11	12,500
Boeing 747-400F	11,800
Source: FAA Advisory Circular 5325-4A, Runway Length Requirements for Airport Design Aircraft Characteristics for Airport Planning (Boeing, McDonnell-Douglas)	

Length requirements for the remaining portion of civil aircraft which may use the airport are summarized in **Table 3E** and have been examined using FAA Airport Design Software (Version 4.2D) which provides runway length requirements for various groupings of aircraft with similar requirements. The appropriate category for the majority of general aviation aircraft is "small airplanes with 10 or more passenger

seats". For this category, the program specifies a runway length of 4,600 feet. Runways 17-35 and 8-26, which serve primarily civilian operations at the airport, exceed this length requirement. The appropriate planning category for the full range of business aircraft which use the airport is "100 percent of large airplanes at 60 percent useful load (payload and fuel)". For this category, the program specifies a runway length

of 6,800 feet. While this length requirement exceeds the existing length of either Runway 17-35 or 8-26, Runways 3L-31R and 3R-21L provide sufficient length to meet this length requirement.

In evaluating the performance characteristics of aircraft which may

provide air passenger service in the future, manufacturer's information was used to verify field length requirements. The Canadair Regional Jet requires 5,250 feet of runway on takeoff, while the Embraer 145 Regional Jet requires 4,920 feet on takeoff.

TABLE 3E
Runway Lengths Recommended For Airport Design

Small airplanes with approach speeds of less than 30 knots	300 feet
Small airplanes with approach speeds of less than 50 knots	800 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,800 feet
95 percent of these small airplanes	3,300 feet
100 percent of these small airplanes	4,000 feet
Small airplanes with 10 or more passengers seats	4,600 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,500 feet
100 percent of these large airplanes at 60 percent useful load	6,800 feet

Source: FAA Design Software Version 4.2D

Runway Width

Runways 8-26, 17-35, and 3R-21L are 150 feet wide. Runway 3L-21R is 200 feet wide. These widths are adequate for aircraft through ADG V. No additional runway width is required to serve civilian aircraft expected to operate at Yuma International Airport through the planning period.

Runway Pavement Strength

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. At the airport, this includes a wide range of military and civilian

aircraft. The current strength ratings for each runway have been summarized in **Table 3F**. These pavement strength ratings are sufficient for the civilian aircraft currently serving and expected to serve the airport through the planning period.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and

TABLE 3F
Pavement Strength Ratings (pounds)

	Runway 3L-21R	Runway 3R-21L	Runway 8-26	Runway 17-35
Single Wheel Loading (SWL)	103,000	162,000	63,000	72,000
Dual Wheel Loading (DWL)	200,000	200,000	137,000	171,000
Dual-Tandem Wheel Loading (DTWL)	400,000	400,000	206,000	255,000

efficient use of the airfield. Presently, access to civilian portions of the airfield is provided by Taxiways A1 and A2, Taxiways I, I1, I2, and I3, and Taxiway H. Taxiways A1 and A2, combined, provide parallel taxiway access for Runway 8-26 and access to the passenger terminal area and general aviation facilities. Taxiways I, I1, I2, and I3 provide access to the west general aviation facilities. Taxiway H1 provides access to the air cargo apron. Taxiway F3 provides access to the Boeing/Douglas Products Division test facility.

The current Airport Layout Plan includes two taxiway improvements to improve airfield access for civilian aircraft and provide more direct and efficient access to civilian facilities. The first improvement involves extending Taxiway I to the Runway 35 end to provide parallel taxiway access the entire length of Runway 17-35. A second improvement involves constructing a parallel taxiway along the north side of Runway 3L-21R and two acute-angled exits midway along Runway 3L-21R to provide efficient access to civilian facilities for large civilian aircraft which cannot use Runways 17-35 or 8-26 due to insufficient runway length. Both improvements will require MCAS approval before completion. These

improvements with enhance airfield efficiency by segregating military and civilian activities and accommodate future growth in civilian activities.

Taxiway width is determined by the ADG of the most demanding aircraft to use the taxiway. As mentioned previously, the most demanding aircraft serving the terminal and general aviation areas are aircraft within ADG II, while the most demanding aircraft to expected to utilize air cargo facilities is in ADG V. According to FAA design standards, the minimum taxiway width for ADG II is 35 feet and 75 feet for ADG V. Therefore, future taxiways serving the terminal and/or general aviation areas should be constructed at a minimum width of 35 feet. Future taxiways serving the air cargo area should be constructed at a minimum width of 75 feet.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

A number of electronic navigational aids are in place to assist pilots in locating and landing at Yuma International Airport. The Bard VORTAC, RNAV, and GPS navigational aids assist pilots during the enroute portion of their flight as well as landing

to Runway 17 during poor weather conditions when following instrument approach procedures established by the FAA. An Instrument Landing System (ILS) installed and maintained by the FAA to Runway 21R also assists pilots in landing at the airport during poor weather conditions when following instrument approach procedures established by the FAA by providing exact approach path and descent information to pilots. The VORTAC, RNAV, and GPS approaches only provide course guidance information.

The advent of Global Positioning System (GPS) technology will ultimately provide the airport with the capability of establishing instrument approaches to other runway ends at minimal cost since there is not a requirement for the installation and maintenance of costly ground-based transmission equipment at the airport. As mentioned previously in Chapter One, the FAA is proceeding with a program to transition from existing ground-based navigational aids to a satellite-based navigation system utilizing GPS technology. Currently, GPS is certified for enroute guidance and for use with instrument approach procedures. The initial GPS approaches being developed by the FAA provide only course guidance information. By the year 1999, it is expected that GPS approaches will also be certified for use in providing descent information for an instrument approach. As mentioned, this capability is currently only available using an Instrument Landing System.

GPS approaches fit into three categories, each based upon the desired

visibility minimum of the approach. The three categories of GPS approaches are: one-half mile, three-quarter mile, and one mile. To be eligible for a GPS approach, the airport landing surface must meet specific standards as outlined in Appendix 16 of the FAA Airport Design Advisory Circular. The specific airport landing surface requirements which must be met in order to establish a GPS approach are summarized in **Table 3G**.

Presently, only Runway 21R fully meets the requirements for a one-half mile visibility GPS approach. The remaining runways lack sufficient pavement markings and approach lighting equipment to meet these standards, however, these runways exceed the requirements for one mile visibility minimum GPS approaches.

According to regional weather observations, visual weather conditions (visibility greater than three miles and cloud ceiling greater than 1,000 feet above the ground) occur nearly 99 percent of the time. Therefore, it would appear that it is not necessary to provide instrument approach capability to one-half mile standards at each runway end. Based upon the prevailing weather conditions and the costs associated with installing and maintaining approach lighting equipment, one-half mile visibility approaches should only be planned for each end of Runway 3L-21R as this runway currently serves as the primary instrument runway and will be the primary runway supporting scheduled cargo operations in the future and can support scheduled passenger airline

operations as well. GPS approaches with visibility minimums of one mile

should be sufficient for civilian operations to Runways 17-35 and 8-26.

TABLE 3G
GPS Instrument Approach Requirements

Requirement	One-Half Mile Visibility	3/4 Mile Visibility Greater Than 300-Foot Cloud Ceiling	One Mile Visibility Greater Than 400-Foot Cloud Ceiling
Minimum Runway Length	4,200 Feet	3,500 Feet	2,400 Feet
Runway Markings	Precision	Nonprecision	Visual
Runway Edge Lighting	Medium Intensity	Medium Intensity	Low Intensity
Approach Lighting	MALSR	ODALS Recommended	Not Required

Source: Appendix 16, FAA AC 150/5300-13, Airport Design, Change 5

MALSR - Medium Intensity Approach Lighting System with Runway Alignment Lighting
ODALS - Omni-directional Approach Lighting System

LIGHTING AND MARKING

Currently, there are a number of lighting and pavement markings aids serving pilots and aircraft using the Yuma International Airport. These lighting and marking aids assist pilots in locating the airport during night or poor weather conditions, as well as assist in the ground movement of aircraft.

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, **Marking of Paved Areas on Airports**, provides the guidance necessary to design an airport's markings.

Runway 3L-21R has the necessary runway markings for the ILS instrument approach to Runway 21R. Runway 17-35 has nonprecision

runway markings to support the VORTAC, RNAV, and GPS approaches to Runway 17. Runway 3R-21L has nonprecision markings, while visual markings are in place on Runway 8-26. These markings are sufficient for the recommended GPS approaches and should be maintained through the planning period.

Taxiway and apron areas also require marking to assure that aircraft remain on the pavement. Yellow centerline stripes are currently painted on all taxiway and apron surfaces at the airport to provide this guidance to pilots. Aircraft parking positions are also clearly marked on each apron area. Besides routine maintenance, these markings will be sufficient through the planning period.

Airport lighting systems provide critical guidance to pilots during nighttime and

low visibility operations. Each runway is equipped with high intensity runway edge lighting (HIRL). These systems are sufficient for the recommended GPS approaches and should be maintained through the planning period.

Effective ground movement of aircraft at night is enhanced by the availability of taxiway lighting. Medium intensity taxiway lighting (MITL) is in place on all taxiways at the airport. These lighting systems are sufficient and should be maintained through the planning period.

The airport is equipped with a rotating beacon to assist pilots in locating the airport at night. The existing rotating beacon is adequate and should be maintained in the future.

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, visual glideslope indicators (VGSI's) are commonly provided at airports. Presently, two types of VGSI's are available at the airport, the visual approach slope indicator (VASI) to Runway 17 and the precision approach path indicators (PAPI's) to each end of Runway 3L-21R and Runway 3R-21L. Facility planning should include installing a VGSI at the Runway 8, 26, and 35 ends.

Approach lighting systems provide the basic means to transition from instrument flight to visual flight for landing. Runway 21R is equipped with a medium intensity approach lighting system with runway alignment lighting (MALSR). This lighting system is essential in maintaining the visibility and cloud ceiling minimums for the

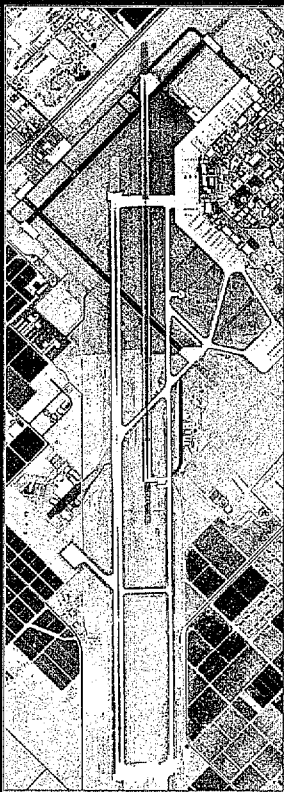
existing ILS instrument approach procedure to Runway 21R and is sufficient for a future one-half mile visibility GPS approach. A similar MALSR lighting system should be planned for the Runway 3L end to support a future one-half mile visibility GPS approach as well.

Runway end identifier lights (REIL) provide rapid and positive identification of the approach end of the runway. While not specifically required for GPS approaches, runway end identifier lights (REIL's) should be planned for each runway end with an instrument approach procedure and not equipped with a more sophisticated approach lighting system. Presently, only Runway 35 is equipped with a REIL.

CONCLUSIONS

A summary of the airfield facility requirements is presented on **Exhibit 3A**. The existing runway orientations, lengths, widths, and strengths are sufficient to serve the expected mix of civilian aircraft through the planning period. Extending Taxiway I to the Runway 35 end and constructing a parallel taxiway along the north side of Runway 3L-21R would improve access to civilian facilities on the airport. Ultimately, GPS approaches with one-half mile visibility minimums should be established to each end of Runway 3L-21R. GPS approaches with one-mile visibility minimums are sufficient for other runway ends. A visual glide slope indicator installed at the Runway 8, 26, and 35 ends would enhance visual operations to these runways. REIL's should be considered for each runway with a GPS approach procedure and not equipped with a more sophisticated approach lighting system.

RUNWAYS and TAXIWAYS



EXISTING

Runway 3L-21R

13,299' x 200'
103,000 pounds SWL
200,000 pounds DWL
400,000 pounds DTWL

Parallel Taxiway E

Runway 3R-21L

9,239' x 150'
162,000 pounds SWL
200,000 pounds DWL
400,000 pounds DTWL

Parallel Taxiway E

Runway 17-35

5,710' x 150'
72,000 pounds SWL
171,000 pounds DWL
255,000 pounds DTWL

Partial Parallel Taxiway I

Runway 8-26

6,145' x 150'
63,000 pounds SWL
137,000 pounds DWL
206,000 pounds DTWL

Parallel Taxiway A1, A2

SHORT TERM NEED

Runway 3L-21R

Same

Runway 3R-21L

Same

Runway 17-35

Same

Runway 8-26

Same

LONG TERM NEED

Runway 3L-21R

Construct Parallel Taxiway
and Acute-angled Exits
Along North Side

Runway 3R-21L

Same

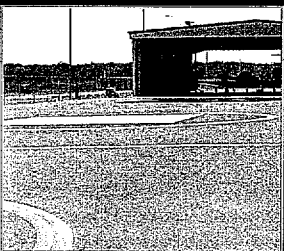
Runway 17-35

Extend Taxiway I to
Runway 35 End

Runway 8-26

Same

NAVIGATIONAL AIDS, AIRFIELD LIGHTING, and MARKING



Rotating Beacon

High Intensity
Runway Lighting

Medium Intensity
Runway Lighting

Precision Runway Markings
(3L-21R)

NonPrecision Runway Markings
(17-35 and 3R-21L)

Visual Runway Markings
(8-26)

VASI Visual Glide Slope
Indicator (VGSI) Runway 17
PAPI (3L-21R, 3R-21L)

REIL (35)

MALSR (21R)

VORTAC, RNAV, GPS, ILS
Instrument Approaches

Same

Same

Same

Same

Same

Same

VGSI 8, 26, 35

REIL 8, 26, 17

Same

One-mile Visibility Minimum
GPS Approaches 8, 26, 35

Same

Same

Same

Same

Same

Same

Same

Same

MALSR 3L

One-half Mile Visibility Minimum
GPS Approaches 3L

YUMA
International Airport

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling of aircraft, passengers, and freight while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs.

TERMINAL AREA REQUIREMENTS

The components of the terminal area include the terminal apron, gate positions, functional areas inside the building, and automobile parking for public, employees, and rental car companies. A new terminal building is currently under construction to replace the existing terminal building built in 1968. The *Terminal Area Master Plan* completed in September 1994 details terminal building requirements for Yuma International Airport. As detailed previously in Chapter One, the new terminal building will provide 45,948 square feet for passenger and airport administration functions. The terminal planning study indicated that 37,380 square feet would be sufficient to serve 190,000 annual enplanements. Considering that this master plan projects annual enplanements growing to 174,000 by the year 2020, the new terminal building should be able to accommodate passenger activity through the planning period, and well beyond.

Concurrent with the new terminal building construction is the reconfiguration and construction of additional parking areas. **Table 3H** compares the parking areas of the new terminal area to the projected requirements at 101,000, 123,000, 148,000, and 190,000 annual passenger enplanements as detailed in the *Terminal Area Master Plan*. As shown in the table, most parking areas are projected to be at maximum capacity at 101,000 annual enplanements. Additional parking areas will need to be planned for through the planning period to accommodate projected vehicle demand.

The existing terminal apron totals approximately 17,200 square yards along the south side of the existing terminal building. The current Airport Layout Plan depicts a 9,700 square yard expansion to the east to accommodate additional parking positions for the new terminal building.

AIR CARGO REQUIREMENTS

The two primary cargo-related facilities requiring analysis include the cargo apron and building space. Presently, there is no single building or facility dedicated solely to air cargo on the airport. FedEx is located within the J-Mar Hangar facility adjacent to airport property along Taxiway I2. UPS and Airborne Express facilities are located off airport. Currently, these operators transfer freight directly from the aircraft to vehicles on the apron. A 17,800-square yard air cargo apron was constructed in 1995 to accommodate air cargo aircraft.

TABLE 3H**Terminal Auto Parking Requirements**

	New Terminal	Requirements at Annual Enplanement Thresholds			
		101,000	123,000	148,000	190,000
Short Term Parking	92	75	91	110	140
Long Term Parking	211	200	244	295	375
Employee Parking	54	46	56	67	87
Rental Car Parking	142	109	133	160	139
Permit Parking	8	15	15	15	15
FAA, Customs, Border Patrol Parking	22	N/A	N/A	N/A	N/A
Airside Parking (Sunwestern Flyers)	4	N/A	N/A	N/A	N/A
TOTAL	533	520	539	647	756

Source for new terminal building parking: Augustus F. Keck and Associates

Source for terminal requirements: September 8, 1994 Terminal Area Master Plan, Edward Just Associates

Note: FAA, Customs, Border Patrol, and Sunwestern Flyers to be relocated

Present scheduling includes two feeder aircraft (such as the Cessna Caravan and Piper Navajo) flights five days per week for each cargo operator. Future apron requirements for the normal growth scenario were determined assuming the gradual transition to jet aircraft by the existing cargo operators through the planning period. The projection assumes four feeder aircraft and one jet aircraft in the short term planning period, two jet aircraft and four feeder aircraft in the intermediate planning horizon, and three jet aircraft and four feeder aircraft in the long term planning horizon. A planning standard of 700 square yards of apron was used to determine feeder aircraft apron requirements. A planning standard of 5,900 square yards of apron was used to determine apron requirements for jet aircraft service.

Apron requirements for the international air cargo scenario were determined by adding a single transport jet to the apron requirements of the normal growth scenario in the short term planning horizon and increasing this to two jets for the intermediate planning horizon and three jets for the long term planning horizon. A planning standard of 7,700 square yards per aircraft was used to account for the larger jet aircraft expected to be used for international air cargo service. A typical planning standard of 500 pounds of enplaned cargo per square foot was used to determine building space. **Table 3J** summarizes air cargo apron and building requirements through the planning period.

TABLE 3J
Air Cargo Requirements

	Currently Available	Current Need	Short Term	Intermediate Term	Long Term
<i>Normal Growth Scenario</i>					
Building Space (s.f.)	N/A	10,000	10,000	20,200	35,800
Apron Area (s.y.)	17,800	4,200	8,700	14,600	20,500
<i>International Air Cargo Scenario</i>					
Building Space (s.f.)	N/A	N/A	18,200	43,800	71,400
Apron Area (s.y.)	17,800	N/A	16,400	30,000	43,600

GENERAL AVIATION REQUIREMENTS

This section will evaluate the space requirements for general aviation hangars and apron. Currently aircraft storage and maintenance is being met with a combination of smaller individual hangars, shade and T-hangars, and larger clearspan hangars which can accommodate multiple aircraft. Presently, general aviation facilities are located in three separate areas of the airport.

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is in more sophisticated (and consequently more expensive) aircraft. Therefore, many hangar owners prefer hangar space to outside tiedowns. Presently, there are 51 available shade and T-hangar positions, as well 28,879 square feet of hangar space which can accommodate multiple aircraft at a time.

Future hangar requirements for the airport are summarized on **Exhibit 3B**. A planning standard of 1,200 square feet per based aircraft stored in T-hangars has been used to determine future T-hangar requirements. A planning standard of 2,500 square feet for large aircraft stored in conventional hangars has been used to determine future conventional hangar requirements. Conventional hangar area was increased by 20 percent to account for future aircraft maintenance needs.

A parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. Approximately 156 tiedowns are available for transient and based aircraft at the airport. Although the majority of future based aircraft were assumed to be stored in an enclosed hangar, a number of based aircraft will still tiedown outside. Total apron area requirements were determined by applying a planning criterion of 700 square yards per transient aircraft

parking position and 500 square yards for each locally-based aircraft parking position. The results of this analysis are presented on **Exhibit 3B**.

General aviation terminal building space is required for waiting passengers, pilot's lounge and flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building but also includes the space offered by fixed base operators for these functions and services. A total of 7,200 square feet of space is provided by the Fixed Based Operators (FBO) at the airport to provide these needs. Based on available terminal space and planning standards, the current FBO terminal space is sufficient for existing and future passenger levels. Future terminal facility needs will be a function of individual FBO needs. Generally, an FBO which constructs a large aircraft storage and maintenance hangar will construct pilot and passenger facilities adjacent to the hangar.

SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, air cargo or general aviation areas have also been identified. These other areas provide certain functions related to the overall operation and safety of the airport and include: aircraft rescue and firefighting, fuel storage, and airport maintenance.

AIRCRAFT RESCUE AND FIREFIGHTING

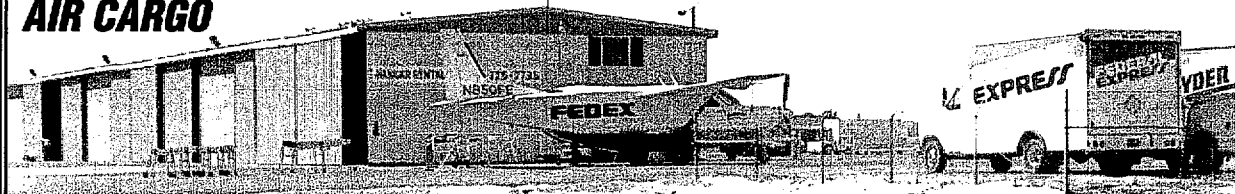
Requirements for aircraft rescue and firefighting (ARFF) services at an airport are established under **Federal Aviation Regulations (FAR) Part 139**. FAR Part 139 applies to the certification and operation of land airports served by any scheduled or unscheduled passenger operation of an air carrier using aircraft with more than 30 seats. Paragraph 139.315 establishes ARFF index ratings based on the length of the largest aircraft with an average of five or more daily departures. The aircraft used by the air carriers currently serving Yuma fall within ARFF Index A.

ARFF services at the airport are provided by the MCAS; therefore, requirements for ARFF facilities were not determined. ARFF requirements should be examined if the MCAS discontinues this service or the airport moves to a higher index rating. A change in index rating is not anticipated through the planning period as Regional Jet aircraft (which may provide air carrier service in the future) are within ARFF Index A.

FUEL STORAGE

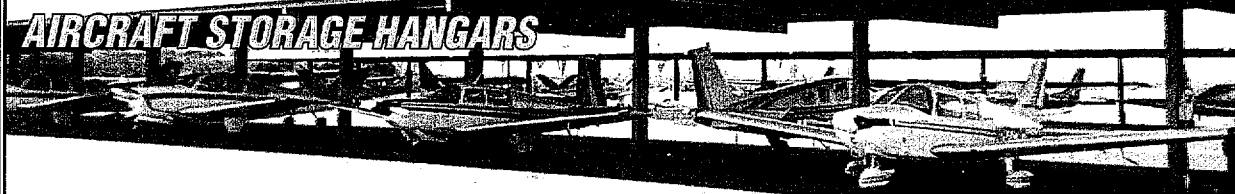
All aircraft fuel storage facilities at the airport are privately-owned and operated by the Fixed Based Operators (FBO's). Fuel is stored in underground tanks and totals 44,000 gallons of

AIR CARGO



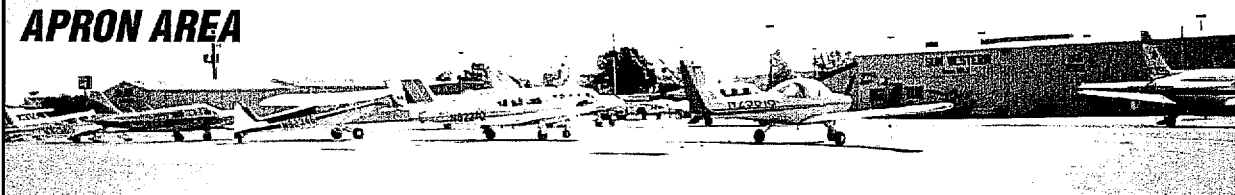
	EXISTING	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Normal Growth Scenario					
Building Space (s.f.)	N/A	10,000	10,000	20,200	35,800
Apron Area (s.y.)	17,800	4,200	8,700	14,600	20,500
International Air Cargo Scenario					
Building Space (s.f.)	N/A	N/A	18,200	43,800	71,400
Apron Area (s.y.)	17,800	N/A	16,400	30,000	43,600

AIRCRAFT STORAGE HANGARS



	EXISTING	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Shade and T-hangar Positions	51	50	60	85	110
Conventional Hangar Positions	----	11	13	20	30
Shade and T-hangar Area (s.f.)	59,250	60,000	71,600	101,500	131,700
Conventional Hangar Area (s.f.)	28,879	26,800	32,300	50,000	75,200
Total Hangar Area (s.f.)	88,129	86,800	103,900	151,500	206,900

APRON AREA



	EXISTING	CURRENT NEED	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Transient Apron Positions	----	15	20	26	33
Locally-Based Aircraft Positions	----	57	53	50	47
Total Positions	156	72	73	76	80
Total Apron Area (s.y.)	112,400	38,700	40,300	43,200	46,800

YUMA
International Airport

100LL Avgas and 56,000 gallons of Jet A. Fuel storage requirements can vary based upon individual supplies and distributor policies. For this reason, fuel storage requirements will be dependent upon the independent distributors.

MAINTENANCE HANGAR & WASH BAY

The YCAA is currently constructing a maintenance facility which will provide 2,000 square feet of floor space and an additional 600 square feet of loft space east of the passenger terminal building. An aircraft wash facility was constructed in 1996 and is located west of Runway 3L-21R near the Diamond Air Airlines hangar facility. Requirements for the expansion of these facilities will be dependent upon YCAA maintenance needs and users of the aircraft wash facility.

AIRPORT ACCESS

Yuma International Airport is primarily accessed using 32nd Street (Business Route 8), the main route through the City of Yuma. The passenger terminal building and some general aviation facilities are accessed via 32nd Street. General aviation facilities located west of Runway 3L-21R are accessed via Fortuna Avenue, Arizona Avenue, 36th Street, and Burch Way. The air cargo apron and Boeing/Douglas Products Division large aircraft test facility are accessed via 4th Avenue to 40th Street.

The Yuma Metropolitan Planning Organization is responsible for countywide transportation planning.

Their most recent planning document is the *1995-2015 Countywide Transportation Plan*. This plan details roadway improvements which will improve access to and from the airport and recommends two preferred routes for future air cargo vehicles. Roadway improvements include widening 32nd Street to six lanes from U.S. Highway 95 (Avenue B) to Interstate Highway 8 and 4th Avenue to six lanes from 32nd Street to 16th Street (U.S. 95). 40th Street, 4th Avenue, and Airport Loop Road are planned to be widened to four lanes. Pacific Avenue, Avenue A, and Avenue B, which are alternate access routes from the city, are planned for four lanes. U.S. Highway 95 is planned as a four lane divided highway south of 40th Street. The recommended air cargo vehicle routes are from Interstate 8 south along either Avenue 3E or Araby Road, west along County 14th Street, north along Airport Loop Road and 4th Avenue to the air cargo area.

Part One of the Circulation Element of the City of Yuma General Plan provides for major roadway development in the City of Yuma. Arizona Avenue, 40th Street, and Avenue A are designated as arterial streets in this plan. 4th Avenue is designated as a collector street.

CONCLUSIONS

The new terminal, terminal apron, and parking expansion should accommodate forecast passenger demand through the planning period. As the existing air cargo carriers transition to jet aircraft, dedicated cargo sort buildings and additional apron expansion may be required. The establishment of an international air cargo operation will

require additional building and apron area above that projected for normal growth of the existing all-cargo operators. To accommodate forecast general aviation demand, enclosed T-hangar and conventional hangar space will be required through the planning period. The number of tiedowns and available apron area appears to be sufficient for future growth. A number of planned roadway improvements should accommodate future traffic growth generated at the airport.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Yuma International Airport through the planning horizon. The next step is to develop a direction for development to best meet these projected needs. The remainder of the master plan will be devoted to outlining this direction, its schedule, and costs.